

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 23

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TAIICHI MORI and AKIRA GYOUTOKU

Appeal No. 96-3893
Application 08/063,302¹

ON BRIEF

Before HAIRSTON, MARTIN, and FLEMING, Administrative Patent Judges.

MARTIN, Administrative Patent Judge.

DECISION ON APPEAL

The subject matter of the invention is a thin film type magnetic head for use with magnetic disks. The height or the width of magnetic head, which is shown as rectangular, is

¹ Application for patent filed May 19, 1993. Applicants claim the benefit of Japanese application 4-131290, filed May 25, 1992, under 35 U.S.C. § 119.

minimized by applying an auxiliary film of soft magnetic material to a surface other than the front surface, which includes the gap. In appellants' Figure 1A, an auxiliary film 19 is applied to the back surface of the magnetic head. Figure 4 shows an auxiliary film 21 applied to a side surface. The auxiliary film may be made of a Ni-Fe series alloy and a nitrogen material (e.g., a Fe-Al-Si-N film) or can be constructed of a multi-layer film such as an Fe-Si/Ni-Fe film (p. 12, lines 16-24).

Claim 1, which is the broadest of the rejected claims (claim 15 is the only other independent claim), reads as follows:

1. A thin film type magnetic head comprising:

a magnetic head assembly including first and second halves each having a magnetic core made of a metallic magnetic material and interposed between two non-magnetic bases, said first and second halves being joined to each other to form a magnetic gap therebetween and form a first surface including said magnetic gap and coming into contact with a recording medium, said magnetic cores of said first and second halves being substantially positioned along the same plane; and

an auxiliary film made of a soft magnetic material, said auxiliary film being disposed on a second surface formed on said magnetic head assembly different from said first surface to magnetically connect with the magnetic cores of said first and second halves, said auxiliary film being so formed as to provide the product of its relative magnetic permeability and its thickness to be above 3000.

The following references are relied on by the examiner:

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Ihara et al. (Ihara)	4,985,796	Jan. 15, 1991
Sakata et al. (Sakata)	5,162,960	Nov. 10, 1992
		(filed Mar. 19, 1990)
Yamada et al. (Yamada)	5,029,032	July 2, 1991
Terada	58-070418	April 26, 1983

(Japanese Application)

Claims 1, 2, 4, 7, 8, 10, 15, 17, 19, 20 and 22 stand rejected under 35 U.S.C. § 103 over Terada in view of Ihara, with additional reliance on Yamada for the first time in the Supplemental Examiner's Answer (at p. 2) to explain why the product of relative permeability and thickness would have been selected to exceed 3000. Claims 9, 13, 14, 21, 25, and 26 stand rejected over Terada in view of Ihara and Sakata. We reverse as to both grounds of rejection.

DISCUSSION

Figure 1(I) of Terada shows the magnetic head structure 17 produced by the manufacturing steps depicted in Figures 1(A) through 1(H). The magnetic head includes two half sections each having a front or upper portion (i.e., elements 1-4) and a back or bottom portion 9, with the gap (g) being formed between the abutting ends of the two front portions. Each front portion includes a laminated magnetic layer 4 sandwiched between two layers 1 of non-magnetic material. The laminated magnetic layer

consists of alternating layers of a metal magnetic material 2 (i.e., Sendust) and a non-magnetic material (i.e., SiO₂). The reason for using Sendust, which has a large saturation magnetic flux density (B_s) (p. 5, lines 22-25), is to avoid magnetic saturation (p. 6, lines 4-6). The Sendust material is provided in a plurality of layers separated by layers of SiO₂ rather than in a single layer in order to reduce the occurrence of eddy currents (p. 6, lines 6-8). Terada explains that in a conventional magnetic head having its entire magnetic core formed of metal magnetic material, such a Sendust, the result is an unacceptably high core loss at high frequencies (30-50 MHz) (p. 3, lines 8-9 and 14-15; p. 6, table). Terada reduces the high-frequency core loss to an acceptable level by using metal magnetic material only in the front portions of the magnetic head; the back portions 9 are formed instead of an "oxide magnetic material (i.e., ferrite)" material (p. 4, lines 16-17), which may be polycrystalline ferrite (p. 5, last two lines) and which has a large characteristic resistance **D** (p. 6, line 1).

Reading claim 1 onto Terada's magnetic head, the examiner's position appears to be that Terada's two front portions, each of which amounts to about a quarter of the magnetic head structure, correspond to the claimed "first and

second halves" of the claimed head assembly. That appellants agree with this interpretation is evidenced by their statement that "back core 9 . . . supports the two halves of the magnetic head" (Brief at p. 11, lines 8-9). Thus, neither the examiner nor the appellants construe claim 1 as requiring that the magnetic metal cores of the claimed first and second halves form a closed magnetic path (but for the gap) in the absence of the claimed auxiliary film, as is the case in both of appellants' disclosed embodiments. Nor do appellants make such an argument with respect to claim 15, which even more specifically recites "first and second C-shaped halves."² Thus, the examiner and the appellants agree that Terada satisfies all of the requirements of claim 1 except for the presence of an auxiliary film of soft magnetic material selected such that the product of the film's relative permeability and thickness is above 3000. For these limitations, the examiner relies principally on Ihara, which discloses a metal-in-gap (MIG) magnetic head consisting of two ferrite core halves 2 and 2' which are held in abutment to form a gap 1 therebetween. These ferrite core halves may be formed of a "Mn-Zn or Ni-Zn soft magnetic ferrite" (col. 5, lines 35-36).

² Although appellants' brief states (at 9) that each of the claims is separately argued, claim 15 is in fact argued (at 13) as standing or falling with claim 1.

The tape-contacting front surface of each ferrite core half includes a V-shaped channel 5 containing a magnetic metal material 3 having a high-saturation magnetization characteristic (col. 5, lines 26-33). The magnetic metal material (which is a soft magnetic material) can be a magnetic alloy, such as an amorphous alloy, Sendust, and permalloy, and can be formed in the channel by sputtering or deposition (col. 5, lines 37-42).³

The examiner contends the artisan would have been motivated for the following reasons to replace Terada's ferrite blocks 9 with films of soft ferrite magnetic material (Answer at 4-5):

It was notoriously old and well known in the art that a ferrite material may be a soft magnetic material, as evidenced by Ihara. Soft magnetic materials were utilized for their advantageous large saturation flux densities.

. . . Soft magnetic materials lent themselves favorably to formation as films by conventional film forming techniques and magnetic thin films were recognized in the art as substitutes for magnetic block members, especially in view of the continued trend in the art towards smaller dimensions for both magnetic heads utilized in disk devices and magnetic heads utilized in tape devices. Also, the fact that soft magnetic materials utilized as films in the art had superior characteristics to common core block materials

³ The examiner initially incorrectly characterized Ihara as teaching that the soft magnetic ferrite material can be formed by sputtering or deposition (final Office action at p. 3), which characterization he withdrew in the Examiner's Answer (at p. 10, para. C).

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had a result that less material was required to provide the desired flux guiding characteristics. Both Terada and Ihara support the above contentions in that they utilize such materials to form their magnetic transducing gaps as opposed to having the transducing gaps formed by block magnetic materials.

At page 9 of the Answer, the examiner additionally relies on Sakata to show that it was known to form magnetic thin films by sputtering:

[O]ne of ordinary skill in the art would have been cognizant of the fact that thin film ferrite was a substitute to block form ferrite. . . . Sakata serves as evidence, for example, of the use of sputtering to form magnetic thin films (note column 5 - line 23 concerning the formation of magnetic thin film layers). Ihara also serves as evidence of the notoriety of forming a magnetic thin film via a method such as sputtering (column 5 - line 40).

The examiner's position is not persuasive. While he argues that it would have been obvious to replace Terada's ferrite blocks with soft ferrite films, the cited prior art discussions of film formation on which he relies relate only to films of metal magnetic materials, which though "soft" are not ferrite magnetic materials. Specifically, Ihara's discussion of sputtering at column 5, lines 36-42 relates to metal magnetic material 3 and Sakata's discussion of sputtering at col. 5, lines 21-25 concerns the metal films 5 and 6. As a result, the cited parts of Ihara and Sakata do not demonstrate that it was known to form films of

soft ferrite magnetic material (e.g., by sputtering), as the examiner contends.

Furthermore, assuming for the sake of argument that it was known to form soft ferrite magnetic films (e.g., by sputtering) and further assuming that, as the examiner appears to believe, soft ferrite magnetic materials (like metal magnetic materials) have high saturation flux densities, it is not understood why the artisan would have wanted to replace Terada's ferrite blocks with films having a high saturation flux density. In fact, Terada specifically teaches away from using a high saturation flux density material (i.e., Sendust) in the back portions 9 of his magnetic head because that would degrade its high frequency performance. Instead, he forms the back portions of a ferrite magnetic material having high resistivity in order to improve the high frequency performance. As a result, we do not reach the question of whether it further would have been obvious in view of Yamada to select the permeability and thickness of such a film to have a product in excess of 3000.

For the foregoing reasons, the rejections of claims 1 and 15 and their dependent claims 2, 4, 7, 8-10, 13, 14, 17, 19-22, 25 and 26 under 35 U.S.C. § 103 are reversed.

REVERSED

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Administrative Patent Judge)	
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